

WHAT IS CLAIMED IS:

1. A data transmission method for placing variable-length transmission data in each frame having a fixed time
5 length to transmit the frame, comprising the steps of:

at a transmitting side,

calculating an error-detecting code of the transmission data in the frame only if the frame contains the transmission data;

10 generating frame data containing the transmission data and the calculated error-detecting code of the transmission data if the frame contains the transmission data, and generating frame data that contains neither the transmission data nor the error-detecting code
15 of the transmission data if the frame does not contain the transmission data; and

transmitting the generated frame data; and
at a receiving side,

receiving the frame data;

20 determining the transmission data and the error-detecting code of the transmission data by determining a predetermined position in the received frame data as the final bit position of the frame data, and calculating an error-detecting code based on the
25 determined transmission data;

deciding that the frame contains the transmission data if the determined error-detecting code

matches the error-detecting code calculated based on the determined transmission data, and deciding that the frame data does not contain the transmission data or the received frame data contains an error if the determined error-detecting code does not match the calculated error-detecting code; and

obtaining the transmission data in the frame based on the result of the decision.

10 2. A data transmission method for placing variable-length transmission data in each frame having a fixed time length to transmit the frame, comprising the steps of:

at a transmitting side,

calculating an error-detecting code of the transmission data in the frame only if the frame contains the transmission data;

generating frame data containing the transmission data and the calculated error-detecting code of the transmission data if the frame contains the transmission data, and generating frame data that contains neither the transmission data nor the error-detecting code of the transmission data if the frame does not contain the transmission data; and

transmitting the generated frame data; and
25 at a receiving side,

receiving the frame data;

assuming the transmission data and the error-

detecting code of the transmission data by assuming one or more final bit positions of the received frame data, and calculating an error-detecting code based on the assumed transmission data;

5 deciding a position to be the final bit position of the frame data if there is the position in the frame where the assumed error-detecting code matches the error-detecting code calculated based on the assumed transmission data among the assumed final bit positions
10 of the frame data, and deciding that the frame does not contain the transmission data or the received frame data contains an error if there is no position where the assumed error-detecting code matches the calculated error-detecting code; and

15 obtaining the transmission data in the frame based on the result of the decision.

3. The data transmission method as claimed in claim 1 or 2, wherein, at the transmitting side, the step of
20 generating the frame data generates the frame data in which the error-detecting code is placed after the corresponding transmission data and the bits of the error-detecting code are arranged in the order that is the reverse of the order of the bits of the transmission data.

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4. The data transmission method as claimed in claim 1 or 2, further comprising the steps of:

at the transmitting side,
conducting error-correcting coding of the
generated frame data; and
conducting interleaving of the frame data that
5 has undergone the error-correcting coding; and
at the receiving side,
conducting deinterleaving of the received frame
data; and
conducting error-correcting decoding of the
10 frame data that has undergone the deinterleaving.

5. The data transmission method as claimed in claim 1
or 2, wherein, at the transmitting side, the data
transmission method further comprises the step of
15 calculating transmission rate information indicating the
number of bits of the transmission data in each frame, and
the step of generating the frame data generates the frame
data containing the calculated transmission rate
information.

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6. The data transmission method as claimed in claim 1
or 2, wherein, if the frame contains the transmission data,
the length of the transmission data is within the range
from 1 to X bits, the length of the error-detecting code
25 associated with the transmission data is Y bits, and the
combination of X and Y is one of (X,Y)=(8,8), (244,12),
(4080,16) , and (1048576,24).

7. The data transmission method as claimed in claim 1, wherein

the data transmission method multiplexes

5 variable-length transmission data for channels in a first channel group of one or more channels and transmission data for channels in a second channel group of one or more channels into each frame having a fixed time length to transmit the frame, and

10 at the transmitting side,

the step of calculating the error-detecting code calculates the error-detecting code of the transmission data for each channel in the first channel group only if the frame contains the transmission data for the channel;

15 the step of generating the frame data generates, for each channel in the first channel group, partial frame data containing the transmission data for the channel and the calculated error-detecting code of the transmission data for the channel if the frame contains the transmission data for the channel, and generates, for each channel in the first channel group, partial frame data containing neither the transmission data for the channel nor the error-detecting code of the transmission data for the channel if the frame does not contains the transmission data for the channel; and

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the step of transmitting the frame data transmits the whole frame data containing the generated partial frame

data for each channel in the first channel group, and
at the receiving side,

the step of receiving the frame data receives the
whole frame data;

5 the step of calculating the error-detecting code
determines the transmission data for each channel in the
first channel group and the error-detecting code of the
transmission data for the channel by determining a
predetermined position in the partial frame data for the
10 channel contained in the received whole frame data as the
final bit position and calculates an error-detecting code
based on the decided transmission data for the channel;

the step of deciding decides, for each channel
in the first channel group, that the partial frame data
15 for the channel contains the transmission data for the
channel if the determined error-detecting code of the
determined transmission data for the channel matches the
error-detecting code calculated based on the determined
transmission data for the channel, and decides, for each
20 channel in the first channel group, that the frame does
not contain the transmission data for the channel or the
partial frame data for the channel contains an error if
the determined error-detecting code of the determined
transmission data for the channel does not match the
25 error-detecting code calculated based on the determined
transmission data for the channel; and

the step of obtaining the transmission data

obtains the transmission data for each channel in the first channel group in the frame based on the result of the decision.

5 8. The data transmission method as claimed in claim 2, wherein

the data transmission method multiplexes variable-length transmission data for channels in a first channel group of one or more channels and transmission data
10 for channels in a second channel group of one or more channels into each frame having a fixed time length to transmit the frame, and

at the transmitting side,

the step of calculating the error-detecting code
15 calculates the error-detecting code of the transmission data for each channel in the first channel group only if the frame contains the transmission data for the channel;

the step of generating the frame data generates, for each channel in the first channel group, partial frame
20 data containing the transmission data for the channel and the calculated error-detecting code of the transmission data for the channel if the frame contains the transmission data for the channel, and generates, for each channel in the first channel group, partial frame data containing
25 neither the transmission data for the channel nor the error-detecting code of the transmission data for the channel if the frame does not contains the transmission

data for the channel; and

the step of transmitting the frame data transmits the whole frame data containing the generated partial frame data for each channel in the first channel group, and

5 at the receiving side,

the step of receiving the frame data receives the whole frame data;

the step of calculating the error-detecting code assumes the transmission data for each channel in the first
10 channel group and the error-detecting code of the transmission data for the channel by assuming one or more final bit positions of the partial frame data for the channel contained in the received whole frame data and calculates an error-detecting code based on the assumed
15 transmission data for the channel;

the step of deciding decides, for each channel in the first channel group, a position to be the final bit position of the partial frame data for the channel if there is the position where the assumed error-detecting code of
20 the transmission data for the channel matches the error-detecting code calculated based on the assumed transmission data for the channel among the assumed final bit positions of the partial frame data for the channel, and decides, for each channel in the first channel group,
25 that the frame does not contain the transmission data for the channel or the partial frame data for the channel contains an error if there is no position where the assumed

error-detecting code of the transmission data for the channel matches the error-detecting code calculated based on the assumed transmission data for the channel among the assumed final bit positions of the partial frame data for the channel; and

the step of obtaining the transmission data obtains the transmission data for each channel in the first channel group in the frame based on the result of the decision.

9. The data transmission method as claimed in claim 7 or 8, wherein dual closed loop transmission power control comprising inner loop transmission power control and outer loop transmission power control is performed for the data transmission between the transmitting side and the receiving side and one or more channels in the second channel group are used as the reference for the outer loop transmission power control without using channels in the first channel group as the reference.

10. The data transmission method as claimed in claim 9, wherein the relative ratio between error-correcting coding ratios of the multiplexed channels and the relative ratio between transmission powers for the multiplexed channels are fixed.

11. A data transmission system for placing variable-

length transmission data in each frame having a fixed time length to transmit the frame, comprising:

in a transmitter,

means for calculating an error-detecting code of the transmission data in the frame only if the frame contains the transmission data;

means for generating frame data containing the transmission data and the calculated error-detecting code of the transmission data if the frame contains the transmission data, and generating frame data that contains neither the transmission data nor the error-detecting code of the transmission data if the frame does not contain the transmission data; and

means for transmitting the generated frame data;

and

in a receiver,

means for receiving the frame data;

means for determining the transmission data and the error-detecting code of the transmission data by determining a predetermined position in the received frame data as the final bit position of the frame data, and calculating an error-detecting code based on the determined transmission data;

means for deciding that the frame contains the transmission data if the determined error-detecting code matches the error-detecting code calculated based on the determined transmission data, and deciding that the frame

data does not contain the transmission data or the received data contains an error if the determined error-detecting code does not match the calculated error-detecting code; and

5 means for obtaining the transmission data in the frame based on the result of the decision.

12. A data transmission system for placing variable-length transmission data in each frame having a fixed time length to transmit the frame, comprising:

10 in a transmitter,

 means for calculating an error-detecting code of the transmission data in the frame only if the frame contains the transmission data;

15 means for generating frame data containing the transmission data and the calculated error-detecting code of the transmission data if the frame contains the transmission data, and generating frame data that contains neither the transmission data nor the error-detecting code of the transmission data if the frame does not contain the transmission data; and

 means for transmitting the generated frame data;

and

 in a receiver,

25 means for receiving the frame data;

 means for assuming the transmission data and the error-detecting code of the transmission data by assuming

one or more final bit positions of the received frame data,
and calculating an error-detecting code based on the
assumed transmission data;

means for deciding a position to be the final bit
5 position of the frame data if there is the position in the
frame where the assumed error-detecting code matches the
error-detecting code calculated based on the assumed
transmission data among the assumed final bit positions
of the frame data, and deciding that the frame does not
10 contain the transmission data or the received frame data
contains an error if there is no position where the assumed
error-detecting code matches the calculated error-
detecting code; and

means for obtaining the transmission data in the
15 frame based on the result of the decision.

13. A transmitter for placing variable-length
transmission data in each frame having a fixed time length
to transmit the frame, comprising:

20 means for calculating an error-detecting code of the
transmission data in the frame only if the frame contains
the transmission data;

means for generating frame data containing the
transmission data and the calculated error-detecting code
25 of the transmission data if the frame contains the
transmission data, and generating frame data that contains
neither the transmission data nor the error-detecting code

of the transmission data if the frame does not contain the transmission data; and

means for transmitting the generated frame data.

- 5 14. A receiver for receiving, for each frame having a fixed length, frame data containing transmission data and an error-detecting code calculated for the transmission data if the frame contains the transmission data, and receiving,
10 for each frame having the fixed length, frame data containing neither the transmission data nor the error-detecting code of the transmission data if the frame does not contain the transmission data, the receiver comprising:

means for receiving the frame data;

- 15 means for determining the transmission data and the error-detecting code of the transmission data by determining a predetermined position in the received frame data as the final bit position of the frame data, and calculating an error-detecting code based on the decided
20 transmission data;

- means for deciding that the frame contains the transmission data if the determined error-detecting code matches the error-detecting code calculated based on the decided transmission data, and deciding that the frame data
25 does not contain the transmission data or the received frame data contains an error if the determined error-detecting code does not match the calculated error-

detecting code; and

means for obtaining the transmission data in the frame based on the result of the decision.

5 15. A receiver for receiving, for each frame having a fixed length, frame data containing transmission data and an error-detecting code calculated for the transmission data if the frame contains the transmission data, and receiving,
10 for each frame having the fixed length, frame data containing neither the transmission data nor the error-detecting code of the transmission data if the frame does not contain the transmission data, the receiver comprising:

means for receiving the frame data;

15 means for assuming the transmission data and the error-detecting code of the transmission data by assuming one or more final bit positions of the received frame data, and calculating an error-detecting code based on the assumed transmission data;

20 means for deciding a position to be the final bit position of the frame data if there is the position in the frame where the assumed error-detecting code matches the error-detecting code calculated based on the assumed transmission data among the assumed final bit positions
25 of the frame data, and deciding that the frame does not contain the transmission data or the received frame data contains an error if there is no position where the assumed

error-detecting code matches the calculated error-detecting code; and

means for obtaining the transmission data in the frame based on the result of the decision.